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G94-1201 Feeding the Dry Cow

Rick J. Grant

University of Nebraska - Lincoln

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Feeding the Dry Cow

This NebGuide discusses feeding management of the dry cow for optimum performance during the next lactation.

Rick Grant, Extension Dairy Specialist

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Dry Cow Management Goals

Every dairy producer's goal for the milking herd should be to maximize feed intake and milk production -- *profitably*. Proper dry cow management provides the foundation for a successful lactation. Management goals for the dry period include:

- properly nourishing the developing calf,
- maintaining optimum body condition score (3.5 to 4.0),
- preparing the mammary gland for the next lactation, and
- minimizing digestive, metabolic, and infectious diseases.

When setting goals for the dry cow program, remember that no **one** program will fit **all** farms, nor even **all the cows on one farm!** The dairy producer must rely on skill and knowledge of the herd to properly adjust management programs. Previous milk production, body condition at dry-off, and herd health history all must be considered when putting together a successful dry cow program.

The Transition Cow

During the transition from lactating to dry, and from the dry period to lactation, the dairy cow is under enormous stress both physically and metabolically. Excessive stress during these transition periods, especially just prior to calving, is associated with:

- increased herd health problems,
- reduced feed intake and milk yield,
- reduced reproductive efficiency,

- increased susceptibility to metabolic and digestive disorders, and
- increased incidence of mastitis.

The transition periods shortly after dry-off and just before calving have the greatest percentage of new mastitis infections occurring.

Dry Matter Intake at Calving Time

Researchers at the University of Wisconsin examined feed intake from 3 weeks before calving to 2 weeks after calving. They found that intake declined by about one third around 7 to 10 days before calving. Following calving, if the cow is fed properly and develops no health problems, feed intake increases steadily. If the cow is not fed and managed properly before calving, when feed intake naturally declines, then you might expect a much slower increase in feed intake following calving.

Table I. Nutrient Requirements for Dry Versus High Producing Dairy Cows					
Nutrient	Units	1989 NRC¹ Dry Cow	Early DryCow	Close-up Dry Cow	High Producing²
Crude protein	%	12	12-13	14-15	18
UIP ³	% of CP	—	28	33	35
NE _L ⁴	Mcal/lb	0.57	0.57	0.68	.78
NDF ⁵	%	35	> 50	> 40	27
ADF ⁶	%	27	> 35	> 25	21
Ca	%	0.39	0.40-.50	0.60	.90
P	%	0.24	0.25	0.30	.50
Mg	%	0.16	0.16	0.20	.30
K	%	0.65	0.65	0.65	1.00
S	%	0.16	0.16	0.16	.20
Vitamin A	IU/day	50,000	100,000	100,000	100,000
Vitamin D	IU/day	15,000	30,000	30,000	30,000
Vitamin E	IU/day	200	400	600-1,000	600-1,000
¹ NRC = National Research Council. ² A cow weighing 1,300 pounds, producing 90 pounds of 4% fat-corrected milk daily. ³ UIP = undegraded intake protein or "escape protein". ⁴ NE _L = net energy for lactation. ⁵ NDF = neutral detergent fiber. ⁶ ADF = acid detergent fiber.					

A properly formulated transition cow, or "close-up" ration, should contain higher nutrient density than the regular dry cow ration so that the desired level of nutrient intake is maintained despite the 20 to 40 percent reduction in intake. *Table I* lists the nutrient requirements for dry dairy cows in three ways. First, the 1989 National Research Council guidelines are listed as a reference point. Second, commonly recommended nutrient levels for the early dry period are listed. These levels have been adjusted based

on practical field experience and observation of herd performance.

Finally, nutrient levels are given for the close-up, or transition cow, which recognize that the cow's feed intake level will be markedly depressed prior to calving.

Switching from a lower quality forage during the first 50 days or so of the dry period to a higher quality forage for the transition ration will help get the cow's rumen adjusted to postpartum forages and promote greater forage intake. Treat the close-up feeding program as a *transition* between the dry cow and the milking rations.

Crude protein content should be increased to 14 to 15 percent and concentrates increased to .5 to 1.0 percent of the cow's body weight. This level of grain will help the cow's rumen adapt to the high-grain diets fed during lactation. If cows are over-conditioned (4+), or there is a history of ketosis in the herd, feed 6 to 12 grams of niacin (vitamin B₆) per cow daily.

Niacin appears to reduce the incidence of ketosis and fatty livers. If supplemental fat is fed in the milking ration, some producers add .25 pounds of that fat to the transition diet to accustom cows to its taste and odor. This practice may minimize intake depressions shortly after calving.

Most producers will need to group cows separately to successfully feed both an early dry period ration and a close-up ration. Many of the most successful dairy producers in the U.S. consider grouping of dry cows to be at least, if not more, important than grouping the milking herd.

Feeding the Early Dry Cow

Four primary goals for feeding the dry cow through the first 40 to 50 days after dry-off include:

- maintaining optimum dietary fiber content,
- limiting energy intake,
- avoiding an overfeeding of crude protein, and
- meeting mineral and vitamin requirements.

The dry cow ration should provide adequate, but not excessive, amounts of required nutrients (*Table I*). Overfeeding energy or protein should be avoided. Excessive energy intake leads to over-conditioned dry cows and increased incidence of metabolic disorders at calving.

Fiber Requirement During Dry Period

Include one percent or more of body weight as coarse, dry roughage in the ration. Low-moisture haylage may replace up to two thirds of this roughage requirement. Ideal roughage sources for the dry period include coarse hays, grass or grass-legume mixtures, and even corn or sorghum stalks when properly supplemented.

Limit corn silage to two percent of body weight. This amount equates, for example, to about 25 to 30 pounds for Holsteins. If corn silage is fed to lactating cows, including 10 to 20 pounds in the dry cow ration may improve intake and rumen function after calving.

Although a cow should eat a minimum of one percent of her body weight as coarse roughage, daily forage dry matter intake should be closer to 1.6 to 1.8 percent of body weight. The total ration of forage and concentrates should contain 80 to 88 percent forage dry matter. Unless body condition score is low

limit concentrate intake to not more than .5 percent of the cow's body weight.

Avoid finely chopped silage or ground hay. Just as in the lactation ration, a chop length of at least 1/2-inch is recommended. Feeding forage of adequate particle length will help to rehabilitate the rumen epithelium and maintain normal rumen function.

Limit legumes in the dry cow ration to less than one percent of body weight, or no more than 30 to 50 percent of the forage dry matter intake. Most legumes contain high levels of crude protein, calcium, and potassium (especially in Nebraska). Cows consuming excessive amounts of crude protein, calcium, and potassium are more susceptible to udder edema, milk fever, ketosis, and downer cow syndrome.

Finally, avoid excellent quality forages for dry cows. These dry cows require higher fiber levels (35 to 50% NDF or more), and high quality forage is best reserved for early lactation cows with high energy requirements.

Energy Requirements During Dry Period

Fiber and energy requirements are interrelated, and how well the diet fills each requirement is reflected in body condition score. The ideal time to recondition dairy cows is during late lactation. The efficiency of feed conversion to body fat stores is 82 percent during late lactation, but only 59 percent during the dry period. If a cow is dried off in proper body condition (3.5 to 4.0), then energy intake can be limited during the dry period. A dry cow feeding program which relies on average quality forages and limited energy intake will minimize incidence of "fat cow syndrome".

Keep in mind that the net energy (lactation) requirement for the dry cow is only .57 Mcal/pound of dry matter. *Table I* compares the nutrient requirements of the dry versus the high-producing dairy cow. Clearly, dry cows should be separated from the milking herd, especially when corn silage is fed free-choice or at high levels to the milking herd. Herds in which dry and lactating cows are fed together often experience higher incidences of fat cows, milk fever, and other metabolic disorders.

Over-conditioning usually occurs during the last 3 to 4 months of lactation when milk yield declines, but grain intake is not reduced. Overfeeding grain or corn silage during the dry period, or prolonged dry periods, can cause excessively fat cows. Although not related directly to feeding management, research indicates that the optimum dry period length is approximately 60 days. Problems associated with fat cow syndrome include:

- abomasal displacements,
- off-feed problems; intake fluctuations,
- milk fever,
- ketosis,
- retained placenta,
- udder edema,
- increased susceptibility to metritis and mastitis, and
- downer cows.

Obviously, none of these conditions are associated with maximum intake and milk production.

Optimum body condition score at dry-off is 3.5 to 4.0, which should be maintained throughout the dry period until calving. Do not put over-conditioned cows on a diet during the dry period! Recent research indicates that fat cows which are forced to lose weight during the dry period risk developing fatty livers.

A body condition score of 3.5 to 4.0 at calving is correlated with maximum milk production at 90 days in milk for all ages of cows.

Meeting the Energy Requirements. Feed little or no supplemental grain when feeding up to 20 pounds corn silage, when forage quality is average or better, or when cows are in very good condition at dry-off (condition score 4.0). Feed 3 to 6 pounds (.5% of body weight maximum) of grain when forage quality is poor, palatability decreases forage intake, cows are under-conditioned, or the weather is severely cold. If challenge-feeding grain about two weeks before calving, feed a maximum of one percent of body weight to avoid metabolic disorders, decreased appetite, and low intake post-calving.

Protein Requirements During Dry Period

The crude protein requirement during the early dry period is 12 to 13 percent of dry matter. If legumes comprise one third or more of the ration dry matter, little supplemental crude protein is needed. With lower quality forages and roughages, the grain mix should contain 14 to 15 percent crude protein. To ensure that the cow's protein requirements are adequately met, the forage should be tested, and an appropriate grain mix formulated. Avoid crude protein deficiencies which decrease intake and nutrient usage. Also avoid crude protein excesses which have been associated with Downer cow syndrome.

Some research shows that diets which meet, but don't greatly exceed, crude protein requirements reduce the incidence of metabolic and periparturient disorders (*Table II*).

Table II. Incidence of Metabolic Disorders in Cows Fed Different Levels of Crude Protein During the Dry Period		
	Crude protein level	
	8.0%	15.0%
Number of cows	27	26
Downer cows	0	8
Abortions	0	3
Parturient paresis (milk fever)	2	4
Displaced abomasum	0	3
Deaths	1	6
(Source: Julien et al., 1977. J. Dairy Sci. 60:210.)		

Mineral Requirements During Dry Period

The primary goal when feeding minerals during the early dry period is to avoid excessive calcium levels and keep the calcium to phosphorus ratio between 2.5:1 and 1.5:1. The control of calcium and phosphorus levels is important for the prevention of milk fever. The calcium requirement for the lactating cow is .80 percent or more of dry matter, while the requirement for the dry cow is only .39 percent (or as low as .20 to .30 percent when milk fever is a severe problem). To achieve these low levels of dietary calcium, legumes should constitute no more than one half of the forage dry matter.

If legumes comprise a large portion of the forage, feed monosodium phosphate at four ounces per head daily to effectively reduce milk fever on high-alfalfa rations. With less than five pounds of legume hay in the ration, use dicalcium phosphate or a commercial supplement with about a 1:1 calcium to

phosphorus ratio instead. Feed a free-choice mixture of 1/3 trace mineralized salt and 2/3 monosodium phosphate.

Salt should be available continuously. About 1.5 to 2.0 ounces per head daily is required. If udder edema is a problem, limit salt intake, especially for seven to 10 days before calving. Although the exact cause of udder edema is unknown, high sodium intakes, protein deficiency, overfeeding grain, anemia, and poor circulation are all possible predisposing factors. The best prevention of udder edema is to avoid feeding excessive salt and to provide a moderate amount of exercise.

Trace minerals which are required by the dry cow include iodine, cobalt, and selenium. Iodine deficiency results in calves born with goiter, whereas calves from cobalt-deficient cows may lack appetite and grow poorly. Selenium deficient cows may give birth to dead or weak calves (white muscle disease) and have a higher incidence of retained placenta. An injection of selenium and vitamin E about 21 days before calving has been effective in reducing the incidence of retained placenta.

Use of Anionic Salts to Prevent Milk Fever

A recent innovation in prevention of milk fever in dairy cows is the feeding of anionic salts for about three weeks before calving. Commonly used anionic salts include ammonium chloride, ammonium sulfate, calcium sulfate, and magnesium sulfate. Use of anionic salts shifts the dietary cation-anion balance in an anionic, or more negative direction. Cations are positively charged compounds, such as potassium and sodium, while anions are negatively charged compounds such as chlorine or sulfur. Feeding a mixture of anionic salts, which contains chlorine or sulfur, gives the diet a "negative charge." Research indicates that an anionic diet will:

- lower blood and urine pH,
- increase calcium absorption and mobilization,
- cause higher blood calcium levels, and
- decrease the incidence of milk fever.

The potential benefits of feeding anionic salts, besides increasing blood calcium levels and decreasing milk fever, include: enhanced muscle tone, increased intake after calving, decreased incidence of retained placenta, displaced abomasum, dystocia (difficult calving), and udder edema, improved milk yield, and improved conception rate.

Anionic salts are most likely to be of benefit when dry cows are fed high-legume diets, and when there is a persistent milk fever problem in a herd. Keep in mind that in many herds, maintaining a low dietary calcium and potassium level will be extremely effective in preventing milk fever. However, if feeding anionic salts appears warranted, the following guidelines should be followed closely:

- Aim for a cation-anion balance of -10 to -15 meq/100 g of dry matter.
- Feed about 200 grams of anionic salts per head daily.
- Begin at about 3 weeks prior to calving and end at calving.
- Feed a combination of salts containing about 40 to 50 percent ammonium chloride.
- Increase dietary calcium level to about 150 grams/day, or about 1.3 percent of dietary dry matter.

The standard recommendation is to feed calcium at less than .40 percent of ration dry matter. When feeding anionic salts you must increase dietary calcium levels to avoid precipitating milk fever.

Finally, anionic salts are unpalatable and must be blended into a premix. Excessive feeding will reduce

feed intake. When using these anionic salts, be sure to work closely with a qualified nutritionist or veterinarian.

Vitamin Requirements During Dry Period

Vitamins A, D, and E are all important for proper dry cow nutrition. If green, well-preserved forage is fed, there is probably little need for supplemental vitamin A. Forages that are badly weather damaged or heated during storage will require more vitamin A supplementation. Corn and sorghum stover, straw and cobs are poor sources of vitamin A. Deficiency of vitamin A in the cow may result in abortions and weak, sickly calves.

Vitamin D supplementation will also be needed when cows are fed forages which are predominantly direct-cut for immediate feeding, or which are ensiled without field curing. Sun curing of leaves improves the level of vitamin D, but often supplemental vitamin D will be required.

If doubt exists about the quality of the forage fed, simply supplement the dry cows with the currently recommended levels of vitamins A, D, and E:

- vitamin A = 100,000 IU/day,
- vitamin D = 30,000 IU/day, and
- vitamin E = 400 to 600 IU/day.

Many nutritionists now recommend increasing the vitamin E level to 600 IU/day in the close-up ration, especially since maximum allowable selenium levels in the diet have been lowered.

Dry Cow Program and Incidence of Metabolic Disorders

The incidence of common metabolic disorders for the top dairy producers in the U.S. are:

- Milk fever, < 5%,
- Displaced abomasum, < 5%,
- Retained placenta, < 8%, and
- Ketosis, < 3%.

How does your herd compare with these numbers? Should you re-evaluate your dry cow program? *Table III* shows the impact of selected dry cow management practices on postpartum disorders. Clearly, management factors such as the feeding program can influence herd health tremendously.

Table III. Impact of Dry Cow Management on Post-Partum Disorders.	
Dry Cow Management	Impact on Fresh Cow
Feeding low calcium diet	Decreased retained placenta, metritis, displaced abomasum and milk fever
Extra Vitamin D	Decreased dystocia, metritis, and displaced abomasum
Housing dry cows with milking herd	Increased milk fever and displaced abomasum
Dry cows fed to increase body weight	Increased incidence of ketosis

Many metabolic and digestive disorders which occur near calving time are interrelated. Milk fever, as a primary disorder, is associated with higher incidences of dystocia, metritis, displaced abomasum, and retained placenta. *Table IV* summarizes the known or suspected relationships among the most common metabolic and digestive disorders of the dairy cow at or near calving time.

As an example of the economic impact that metabolic disorders may have at the time of calving -- consider milk fever. A cow with milk fever may produce up to 14 percent less milk during her lactation. For a cow producing 20,000 pounds of milk, that equates to 2,800 pounds less milk in a lactation. At \$12.50/cwt, that would be a \$350 loss for the lactation. Also, keep in mind that milk fever increases the risk of other disorders (as shown in *Table IV*) and usually shortens the productive life of a cow.

Table IV. Metabolic and Digestive Disorders in the Dairy Cow at Calving.						
Secondary Disorder	Primary Disorder					
	Milk Fever	Dystocia	Retained Placenta	Metritis	Displaced Abomasum	Ketosis
Dystocia	X					
Retained Placenta	X	X				
Metritis	X	X	X		X	X
Displaced Abomasum	X	X	X	X		
Mastitis	X	X	X	X		X
Low Conception Rates	X	X	X	X	X	X
(Source: Correa et al. 1993. J. Dairy Sci. 76:1305.)						

Successfully Feeding the Dry Cow - General Management Guidelines

To profitably feed and manage your dry cows, consider grouping strategy, housing, feeding behavior, and proper acclimation of heifers as they enter the milking string for the first time. If you follow the nutritional guidelines given in this NebGuide, and properly group your dry cows, they will be positioned for optimum performance in their upcoming lactation. Remember, the dry period is both the end of one lactation and the *beginning of the next*.

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